

Although operation has been described with quadrupole rods 44, other multipole rod sets, e.g. octopole and hexapole sets, may be used where appropriate.

I claim:

1. A method of analyzing ions in an ion trap, said method comprising the steps of:

- (a) producing a stream of said ions,
- (b) selecting a set of parallel rods having a space therebetween, said space having first and second ends,
- (c) generating a two dimensional multipole RF field in said space by applying an RF voltage to said rods,
- (d) directing said stream of ions into said first end of said space,
- (e) trapping some of said ions in said space for a predetermined period of time and ejecting others of said ions from said space, said trapping being performed by applying selected electric potentials at said ends of said space to cause ions travelling in said space from said first end toward said second end to be reflected back toward said first end and then to be reflected back again toward said second end, thus to retain ions in said space for said predetermined period of time, said predetermined period of time being longer than that required for ions to travel once through said space from said first to said second end,
- (f) releasing the ions trapped in said space through said second end of said space into said ion trap,
- (g) analyzing said ions in said ion trap, and
- (h) while said ions in said ion trap are being analyzed, refilling said space with some ions from said ion stream, and repeating said step (e) while said ions in said ion trap are being analyzed.

2. The method according to claim 1 wherein said multipole rods have a quadrupole configuration.

3. The method according to claim 1 or 2 wherein ions are ejected from said space by resonant ejection.

4. The method of claim 1 or 2 wherein ions are ejected from said space by resonant ejection, by scanning the frequency of an auxiliary RF voltage applied to said rods.

5. The method of claim 1 or 2 wherein ions are ejected from said space by resonant ejection, by scanning the amplitude of said RF voltage applied to said rods while applying a fixed frequency auxiliary voltage to said rods.

6. The method of claim 1 or 2 wherein ions are ejected from said space by resonant ejection, by applying to said rods an RF noise spectrum containing frequency components which has deleted therefrom those RF frequencies corresponding to the resonant frequencies of ions to be detected.

7. The method of claim 1 or 2 wherein ions are ejected from said space by setting the amplitude of an RF voltage applied to said rods at a level to eject ions below a predetermined mass.

8. The method of claim 1 or 2 and including the step, when ions are trapped in said space, of exciting the resonant frequency of a selected ion to cause collision induced dissociation of such ion.

9. The method of claim 1 or 2 wherein the gas pressure in said rods is in the range 10^{-3} torr to 10^{-4} torr.

10. The method of claim 1 or 2 wherein the gas pressure in said rods is about 10^{-4} torr.

11. The method of claim 1 or 2 wherein the gas pressure in said rods is about 5×10^{-4} torr.

12. An ion inlet and processing system comprising: means for generating a stream of ions, a multipole set of parallel rods defining a space therebetween, said space having first and second ends, means for applying an RF voltage to said rods for producing a two dimensional multi-pole RF field in said space, means for directing said stream of ions through said first end into said space, control means for controlling said rods to trap some ions from said stream in said space for a predetermined period of time and to reject other ions from said space, said control means including means for applying selected electric potentials at said first and second ends to cause ions travelling in said space from said first end toward said second end to be reflected back toward said first end and then to be reflected back again toward said second end, thus to retain ions in said space for said predetermined period of time, said predetermined period of time being longer than that required for ions to travel once through said space from said first to said second end, an ion trap, said control means including means for releasing ions trapped in said space through said second end into said ion trap, said control means including means for admitting new ions from said stream into said space while said ion trap is performing an analysis, for said rods to trap some of said new ions in said space for a new said predetermined period of time and to reject others while said ion trap is performing said analysis.

* * * * *

50

55

60

65